VAA-Weekly-Progress

09/11-09/17

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Context

- Last week, we decided on our baseline model to be RTMPose based on a qualitative analysis on our data
- We are leaning towards the AP-10k dataset based on a small comparison of AP-10k and AnimalPose using the HRNet Architecture
- Our goals for this week were to work on finalizing a labeling software, establishing a definition for keypoints for our dataset, and finding out about the formatting for data loading

Agenda

- Deciding on the labeling tool to use
- Establishing a definition of keypoints for our dataset
- Finding out about formatting of images for data loading

Goals for the Week

- Determine which **labeling tool** to work(Labeling Studio, Label Me, CVAT, COCO Annotator)?
  - Good at aggregating everyone's labels together
  - How easy to convert to COCO format?
- **How do we want to label** (where do we want each keypoint to be)?
  - Do we want to follow biologically accurate key points locations or key points that could be "easier" to detect -> 300 Faces, AP-10K, Animal Pose.
  - Deliverable: Completed Labeling Instruction Google Document
  - Assigned to: Medha, Claire, Armaan, Aryan, Shaan
- Look into **formatting for AP10K and AnimalPose** (which dataloading module)
  - Look at how Label Studio outputs labels and how OpenMMPose inputs labeling data(how they store the labels, and how they load labels into the model)
  - Assigned to: Parth & Josh
- Time Permitting: Use OpenMMPose to train the RTMPose model on Animal Pose so it can contrasted against RTMPose trained on AP-10k

Deciding on Labeling Tool

Labeling Tool

Requirements:

- Easy organization of labels from multiple annotators
- Ability to set a keypoint configuration
- Intuitive UI

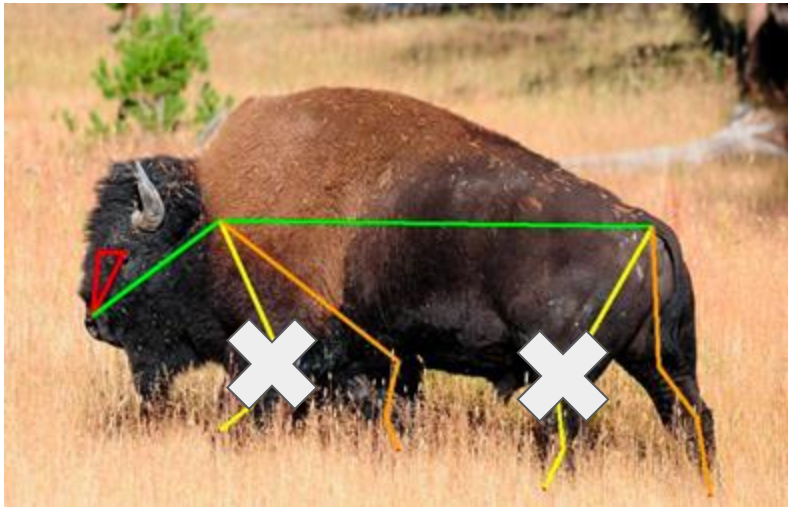
Label-Studio:

- Set up on the shared account on DeadCat
- All labels are stored in a centralized database
- Startup script allows multiple users to label images at the same time
- Quality control and validation tools

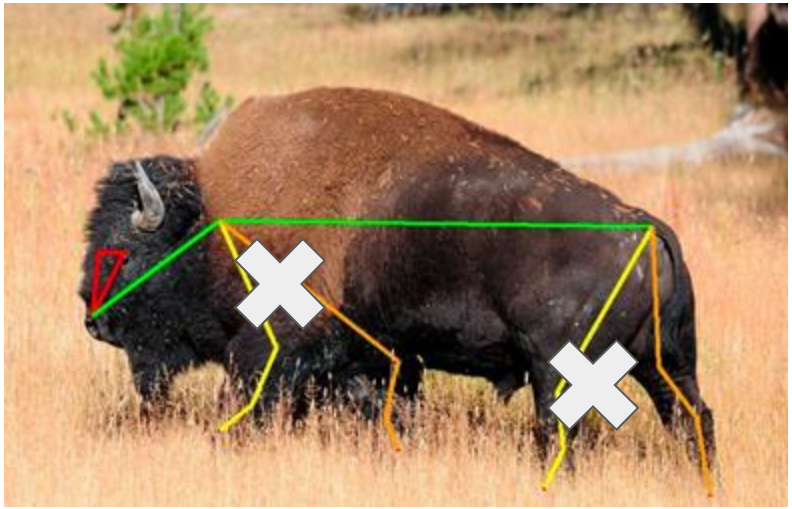
Defining Keypoints for our Dataset

Key Problems:

Where should we put hip, elbow/knee, and neck keypoints?
How should we deal with occlusions?



or



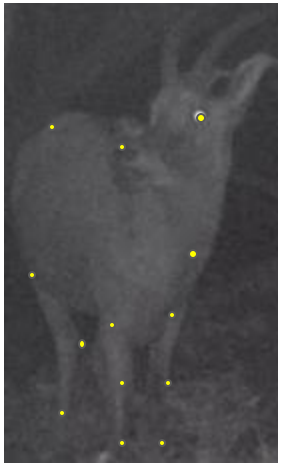
How do We Want to Label Images?

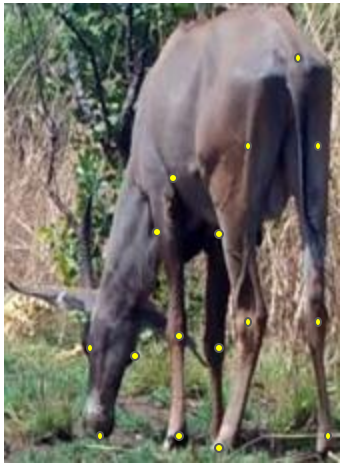
Proposal:

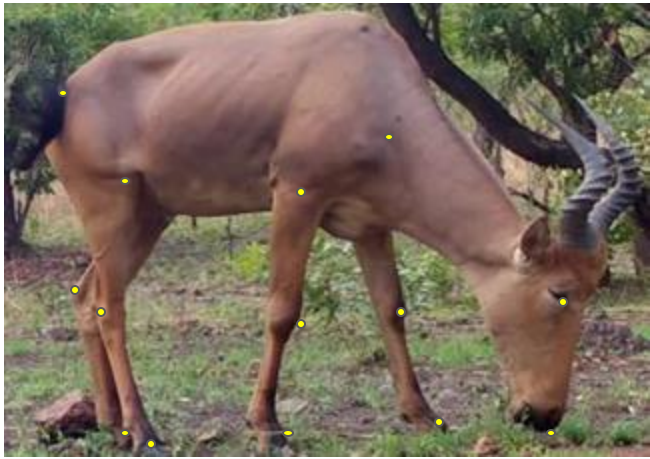
Hips: in center of leg close to the joint - follow the contour of the leg to find point

Knees: label front knees close to the bend of the joint towards the front, label back knees close to the bend of the joint towards the back

Neck: at the base of the neck - following natural coloring and contours







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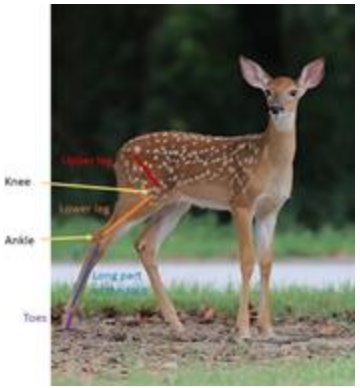
Justification of Proposal (Hip and Knee Keypoints)

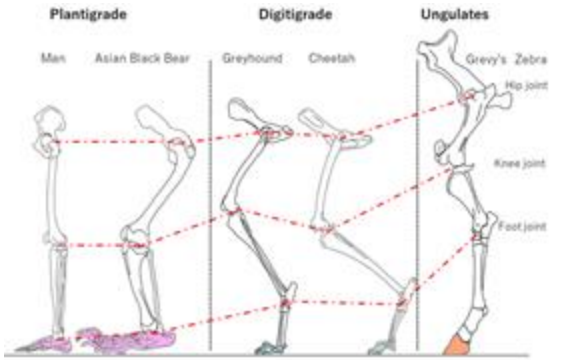
Hips:

- From instructions for AP-10K: “hip”-keypoints for ungulates are their knees
- Knee joint is more distinguishable than hip joint

Knees:

- From instructions for AP-10K: “knee”-keypoints for ungulates are their ankles
- Actual knee is used for hip-keypoint + ankle joint is distinguishable

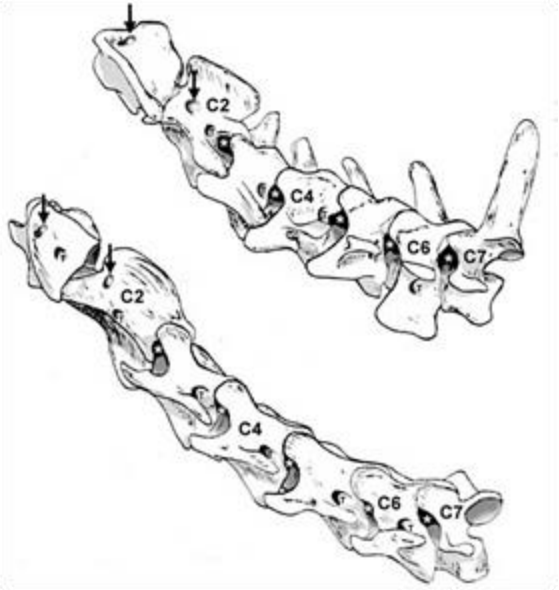




Justification of Proposal (Neck Keypoint)

Neck:

- According to research done at NIH: posterior neck joints (C4-C7) most mobile for even-toed ungulates
  - I.e., Base of neck is main point of motion
- Point of separation from neck and torso → easier to identify when labeling



Cervical vertebrae. Ox (top); horse (bottom). **Arrows**, lateral foramen; **T**, transverse foramen; *, intervertebral foramen

Occlusions

Q. How do we handle occlusions: do we place keypoints over the object or leave them out?

A. Why not just do both?

- Half of the team can will label the keypoints over the object
- The other half will simply omit the keypoints that are blocked by the object
- We will then have 2 versions of the same dataset and can compare the performance
- We can further keep subsetting our dataset as per other new requirements and at each stage compare and choose the best version
- This could also be a research field from which we can derive possible research questions

Formatting the Images for Training

Notes about AP-10K & AnimalPose data format

- Contains images and annotations folder (For AP-10K)
- Images folder contain all images
- Annotations folder contains JSON in COCO format
  - JSON files to identify and select images from the image folder and define their attributes
  - Also identifies keypoints, bounding boxes and more information following identification of image source and selection
- AP-10K & Animal Pose follow same JSON file format

Converting Labeled Images to COCO Format

OpenMMPose has a guide for how to convert the .json file generated by Label Studio of the key points to the COCO format needed by OpenMMPose models.

Main Steps:

- Configure label interface of Label Studio json file data(MMPose provides examples)
- Export all key point annotations from Label Studio as a .json file(don't export directly uploaded images, as label studio truncates long file names)
- Run the provided script "tools/dataset_converters/labelstudio2coco.py" to convert the label studio .json to COCO format .json file

Next Steps

- Finalize proposal for keypoint definition, and clearly write up with examples for clarity during annotation
- Start labeling keypoints on our dataset, using the keypoint definitions
- Train RTMPose on Animal Pose(since OpenMMPose does not provide pretrained model) for the purposes of a complete evaluation of the two models(RTMPose and HRNet) on the two datasets(AP-10k and Animal Pose), to further confirm our choice of dataset to use in combination with RTMPose

Personal Progress

Medha

- Annotated 100 images with labels (Set 4)
- Downloaded OpenPose on personal deadcat
- Looked into how AP10k was annotated
- Came up with proposal for our definition of keypoints
- Met with team to evaluate proposal

Armaan

- Annotated 100 images (Set 5)
- Looked into how Keypoints are defined and how they are placed
- Looked into how AP10k is annotated
- Drafted proposal for keypoint definition, placement and how to handle occlusions
- Met with team to evaluate current and next steps

Claire

- Annotated 100 images (Set 2)
- Researched anatomy of ungulates to understand their mobility and its relevance/importance to keypoints
- Met with team to determine proposal and next steps
- Provided justification to proposal

Shaan

- Annotated 100 images (set 3)
- Met with team to discuss next steps
- Installed and set up a labeling software on the shared account of DeadCat. Added a startup script to allow multi-user concurrent annotating
- Started shared document for everyone to put labeling instructions

Josh

- Annotated 100 images (Set 1)
- Looked into the format of the AP-10k and Animal Pose data sets implement in models from OpenMMPose on the deadcat server(to determine what steps would need to be taken for us to import and use our own keypoint data to finetune RTMPose)
- Determined how to export labeled keypoint data from Label Studio to COCO format so it can be used by RTMPose
- Met with team to evaluate current and next steps

Parth

- Annotated 100 images (Set 6)
- Checked out the formatting of the AP-10k and Animal Pose datasets to see what format our data will need to be in moving forward.
- Explored Label Studio and set up account to begin keypoint labeling as needed
- Met with team to discuss findings and proposal

Aryan

- Annotated 100 images(set 0).
- Set up label studio account for labeling
- Discussed finding, proposal and next steps with the team